

# PATENT COOPERATION TREATY

From the:  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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PCT

WRITTEN OPINION

27 [03 2001]

(PCT Rule 66)

Date of mailing  
(day/month/year) 22.12.2000

Applicant's or agent's file reference  
ICIX/P22915PC

REPLY DUE

within 3 month(s)  
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International application No.  
PCT/GB00/01861

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International Patent Classification (IPC) or both national classification and IPC

C07C17/087

Applicant

IMPERIAL CHEMICAL INDUSTRIES PLC et al.

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I  Basis of the opinion
- II  Priority
- III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV  Lack of unity of invention
- V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI  Certain document cited
- VII  Certain defects in the international application
- VIII  Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4. For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis. For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 18/09/2001.

Name and mailing address of the international preliminary examining authority:



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**I. Basis of the opinion**

1. This opinion has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".*):

**Description, pages:**

1-9 as originally filed

**Claims, No.:**

1-7 as originally filed

**Drawings, sheets:**

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description,        pages:
- the claims,        Nos.:

the drawings, sheets:

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):  
*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	see separate sheet
Inventive step (IS)	Claims	see separate sheet
Industrial applicability (IA)	Claims	

2. Citations and explanations  
**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

SECTION VIII:

According to the definition of the subject-matter claimed in claim 1, the present process for the production of 1,1,1,2,3,3,3-heptafluoropropane (HFC 227ea) by the reaction of hexafluoropropene (HFP) with hydrogen fluoride is characterised by the finding that the reaction product phases separate in the liquid phase to afford an organic-rich phase, which comprises HFC 227ea and HFP and on the other hand a hydrogen fluoride rich phase. Based on this finding, the description of the application emphasizes **two** different aspects of the process.

The first aspect (see page 3, from line 19), which is consistent with the formulation of the present claim 1, is based on five steps, namely (A) charging the reaction mixture from the reaction of HFP with HF to the liquid-phase separator thus allowing separation, (B) recycling the HF-rich phase separated in Step A to a reactor, (C) charging the organic rich phase to a distillation column and thus (D) recovering the HFC 227ea and an HF-rich mixture separately from the distillation column, (E) recycling again the HF-rich mixture recovered from step D to the reactor.

On page 4, lines 11-12, it is mentioned that an addition of HFP facilitates separation although the observation is directed to a HFC 227 ea / HF azeotrope which is not mentioned in claim 1.

Also an addition of HFP is not mentioned in claim 1. It is mentioned in the description that the reaction according to this first aspect may be carried out in the liquid phase as well as in the vapour phase, which is of course inconsistent with the wording of claim 1, e.g. liquid phase separator.

In the description page 4, last two lines, it is stated that HF is charged to the liquid phase separator in step A which again is inconsistent with the definition of the claim 1 wherein HF is recycled to the reactor in which the reaction is carried out. This brings us to what is described as a "second embodiment of the process according to the first aspect". Again there is no support in the claims for this second set of "embodiments". A further point (see page 5, lines 22-25) is that the molar ratio of HF to HFP fed to the reactor is expressed as if it was an essential feature, which then would have to find a support in the description of the application.

A similar objection is raised for the molar ratio of HFP to the catalyst (see page 5, lines 26-27). It is noted that first of all a catalyst is not mentioned in the definition of the claim and if this feature should be looked at only with regard to the production step of HFC 227ea by the reaction of HFP with HF if this feature is essential in the further

processing of the reaction product, then this essential feature should be expressed in detail also in claim (see also lines 28-30 on page 5).

On page 6, line 3, it is stated that the process can alternatively be carried out in the vapour phase. Such statement finds no support in the definition of the subject-matter according to claim 1.

Going back to a point that per se requires careful consideration, from the description of the process it is stated that the molar ratio of HF to HFP is at least 1:1. The following question is raised: if there is no excess of HFP, and no further addition of HFP in the reaction mixture of HFP with HF, how does a phase separation take place (please see the examples and on the other hand the statement on page 3, lines 17-18). Critical revision appears necessary.

Further points are raised with regard to the set of claims:

Claim 6 is not clear based on the consideration that the reaction in the reactor involves necessarily the reaction of HFP with HF.

Claim 7 is not supported by the description. If this is the mixture which is actually charged in the separator, it appears that this feature would belong to the main claim. The values relating to temperature and pressure should be detailed according to the description.

In claim 1 the shorter expressions "HFC 227ea" and "HFP" should be reformulated at the light of their actual meaning.

The application should be reformulated towards one invention. All further matter should be deleted or formulated accordingly with the view of rendering the subject-matter claimed clear. Statements which bring doubts on the subject-matter claimed should be deleted.